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10/656,584	09/04/2003	Li Te Hsu	67,200-1117	7928

7590

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EXAMINER

TRAN, BINH X

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 04/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/656,584

Applicant(s)

HSU ET AL.

Examiner

Binh X. Tran

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 04 September 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-17 and 20 is/are allowed.
- 6) ☒ Claim(s) 1-6, 9-10, 18-19 is/are rejected.
- 7) ☒ Claim(s) 7 and 8 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 April 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 25A (in page 10 line 13 of the specification). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "26B" has been used to designate both as a protect layer over the gate structure and source/drain region (Fig 1C). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

3. The disclosure is objected to because of the following informalities:

In page 9 of the specification, applicants discloses "spacers e.g., 26A" (line 13), and "doped region e.g., 26A" (line 15). In page 11 of the specification, applicants disclose "photoresist mask 26A" (line 2). The applicants cannot use the same reference number 26A to describe three different structures (i.e. spacers, doped regions, and photoresist mask)

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

4. Claims 18-19 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

In the independent claim 11, applicants disclose that the plasma source gas comprises "fluorine containing gas, oxygen, and hydrogen." However, in claim 18, applicants define that "the plasma source gases consist essentially of an inert gas and H<sub>2</sub> gas". This limitation is contradicted with the previous limitation in claim 11 that discloses the plasma source gas comprises "fluorine containing gas, oxygen, and hydrogen". According to the MPEP 2111.03, the transitional phrase "consist essentially

of" limits the scope of a claim to the specified materials or steps and those that do not materially affect the basic and novel characteristic(s)" of the claimed invention. It is known in the art, that fluorine containing gas and oxygen is an active ingredient gas and certainly will have materially affect on the etching process (See Luo et al.). Once the applicants defines the plasma source gases comprises active ingredient gas components (i.e. oxygen and fluorine containing gas) in the independent claim (claim 11), applicants cannot exclude these active gas components in the dependent claim (claim 18) by defining "the plasma source gas consist essentially of an inert gas and H<sub>2</sub> gas". However, applicants certainly can define a new plasma source gas such as a second plasma source gas consist essentially of an inert gas and H<sub>2</sub> gas.

Claim 19 is rejected under 35 U.S.C. 112, first paragraph because it has contradicted limitation "wherein the plasma source gases consist essentially of a N<sub>2</sub> and H<sub>2</sub>" for the same reason as discussed above.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-4, 6, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng et al. (US 6,762,085) in view of Luo et al. (US 6,379,576).

Respect to claim 1, Zheng discloses a method comprising the steps of:

providing a silicon substrate (1) including a polysilicon gate structure (3) (col. 2 lines 40-67, Fig 1);

masking a portion of the silicon substrate with photoresist (6) to carry out an ion implantation process for forming source and drain regions (Fig 3);

carrying out an ion implantation process (Fig 5-6, col. 4 line 40 to col. 5 line 14);

removing the photoresist (col. 4 lines 14-15).

Zheng fails to disclose the photoresist layer is removed by using plasma assisted process comprising fluorine containing, oxygen, and hydrogen containing plasma source gas. However, Zheng clearly teaches the step of removing the photoresist layer using plasma assisted process. In a method for removing photoresist material, Luo teaches to a process for fast removal of photoresist with minimal oxide loss by using plasma assisted comprising fluorine containing, oxygen, and hydrogen containing plasma (col. 9 lines 15-35, col. 10 line 55 to col. 11). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Zheng in view of Luo by using plasma assisted comprising fluorine containing, oxygen, and hydrogen

containing plasma to remove photoresist material because this technique is capable of fast removal of photoresist with minimal oxide loss.

Respect to claim 2, Luo discloses plasma etching process whereby fluorine containing, oxygen and hydrogen containing plasma source gases are simultaneously provided (col. 11 lines 58-64). Respect to claims 3-4, Luo discloses the plasma source gas consisting essentially of  $\text{CF}_4$ ,  $\text{O}_2$ ,  $\text{H}_2$  and  $\text{N}_2$  (col. 11 line 59 to col. 12 line 5).

Respect to claim 6, Luo discloses at least one plasma is carried out wherein the RF power is not applied (col. 11 line 60-64, read on "carried out at a zero RF bias").

Respect to claim 9, Zheng discloses a silicon oxide layer (2) is provided over the silicon substrate (1) prior to the ion implantation (Fig 1, col. 2 lines 55-57).

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng in view of Luo as applied to claim 4 above, and further in view of Xu et al. (US 6,479,396).

Respect to claim 5, Zhang and Luo fail to disclose the  $\text{N}_2$  and  $\text{H}_2$  are provided having volumetric of  $\text{N}_2$  to  $\text{H}_2$  of about 10:1 to 1:10. However, Luo clearly teaches to use gas comprises  $\text{N}_2$  and  $\text{H}_2$ . In a method for removing photoresist material, Xu teaches to use gas comprising  $\text{N}_2$  at 100% - X% and  $\text{H}_2$  at X% wherein  $X = 0-10$  in order to improve surface topography (col. 7 lines 33-35, col. 8 lines 12-33). Since  $X = 0-10\%$ , the volumetric percentage of  $\text{N}_2$  would be in the range of 90% to 100% (100% - X). The ratio of  $\text{N}_2$  to  $\text{H}_2$  would fall 100:0 to 9:1 (within applicants' range). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Zheng and Luo in view of Xu by having volumetric of  $\text{N}_2:\text{H}_2$  as suggested by Xu because it will help improve surface topography.

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng in view of Luo as applied to claim 1 above, and further in view of Robertson (US 6,699,771).

Respect to claim 10, Zheng and Luo fail to disclose that an amorphous silicon region is created at the silicon surface following the ion implantation process. In a semiconductor process, Robertson teaches to create amorphous region (22) at the silicon surface following the ion implantation process in order to minimize lattice defects (col. 4 line 40 to col. 5 line12). Robertson further discloses that minimizing lattice defects is advantageous in minimizing leakage current (col. 5 lines 1-3). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Zheng and Luo in view of Robertson by forming amorphous region because this will minimize lattice defects and leakage current.

***Allowable Subject Matter***

9. Claims 7-8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. Claims 11-17, 20 are allowed.

11. The following is a statement of reasons for the indication of allowable subject matter: The cited prior arts fail to disclose or suggest either one of the following step in conjunction with all other limitation in the claims: wherein at least one plasma assisted process comprises at least on sequential etch / plasma treatment / etch process wherein the etch process comprises at least one of fluorocarbon/oxygen and



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fluorocarbon/oxygen/hydrogen/inert gas chemistry and the plasma treatment process comprises a hydrogen/inert gas chemistry; or removing the photoresist according to a plasma assisted process comprising fluorine containing, oxygen, and hydrogen containing plasma source gases to coordinatively saturate at least a portion of the coordinatively unsaturated silicon bonds.

### ***Conclusion***

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X. Tran whose telephone number is (571) 272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Binh Tran*

Binh X. Tran